TRANSLATION

UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session of 2005/2006

April/May 2006

EBS 339/3 - Mineral Economics

Time : 3 hours

Please check that this examination paper consists of SEVEN pages of printed material and THREE pages APPENDIX before you begin the examination.

This paper contains SEVEN questions, FOUR questions from SECTION A and THREE questions from SECTION B.

Answer any FIVE questions. Answer TWO question from SECTION A, TWO question from SECTION B and TWO questions from any of the sections. If a candidate answers more than five questions, only the first five answered will be examined and awarded marks.

Answer to any question must start on a new page.

All questions must be answered in Bahasa Malaysia.

...2/-

2. Cash flow for a copper mining project are as given in the following Table 1:

Table 1

Year	Capital Expenditure (RM 000)	Gross Income (RM 000)	Operating Cost (RM 000)
-3	1500		
-2	2500		
-1	3200		
0		11500	3500
1		9500	3200
2		13600	5000
3		5000	4100
4		18000	3600
5		4000	4000
6		14300	3400

The mining company also has to pay royalty to the state government from Year 1 to Year 6 at RM250 annually.

Assume (i) Total Depreciation of RM 2,000,000 for the first 3 years.

(ii) Total Depletion was done equally for 6 years at RM 200,000 yearly

(a) If the income tax is charged at 40% from annual taxed income, table the net income cash flow for the project from Year 1 to Year 6.

(5 marks)

(b) Calculate the net present value income if the capital cost is 10%.

(5 marks)

...4/-

(c) Calculate the Discounted Cash flow Internal Rate Of Return for the project.

(7 marks)

(d) Calculate the Payback Period for the project.

(3 marks)

3. A company planned to invest in a fine separation system. Two system has been identified suitable for these purposes and the cast flow analysis is proposed to be evaluated. System K need capital investment of RM 5,000,000 and give the net cash flow of RM 1,000,000 throughout the mine life of 9 years. System L need capital investment of RM 7,800,000 and annual net cash flow of RM 1,500,000 for 9 years. If the capital cost is 10%

(i) Calculate the Discounted Cash Flow Internal Rate of Return for System K and System L

(12 marks)

(ii) Which system should you choose and explain why?

(8 marks)

4. [a] Give the definition **or** explain the following:

(i) In-Direct Operating Cost
(ii) Depreciation
(iii) Channel Sampling
(iv) Drill Hole Sampling

(8 marks)

...5/-

[b] Projects with negative cashflows occurring after positive cashflows will give meaningless results by the discounted casflow method. A Cash flow for a project found to give a negative value as shown in Table 2. If the capital cost is 10%, modify the cashflow to eliminate the negative value.

Table 2

Year	**0**	**1 ke 5**	**6**	**7**	**8**
Cash Flow	-2500	950	1100	1250	-2500

(6 marks)

[c] Why sensitivity analysis is important in a mining project? Discuss in brief the related factors by mentioning the most sensitive factors that effect the cash flow.

(6 marks)

...6/-

PART B

5. [a] Discuss, with the aid of diagrams, the phases to be carried out in the ore reserve estimation of a gold deposit with the following statistical evaluation techniques:

(i) Inverse Distance Method,
(ii) Polygonal Method,
(iii) Triangular Method.

(15 marks)

[b] Describe what you understand, with the assistance of any formulae, for the following factors normally used in the application of the Geostatistical technique:

(i) Estimation Variance,
(ii) Dispersion Variance,
(iii) Semi-variogram.

(5 marks)

6. [a] Discuss the phases of work in the usage of the Geostatistical method for ore reserve evaluation of a diamond deposit to be used for a feasibility project.

(10 marks)

[b] Discuss the benefits of using the Kriging technique in estimating the grades of a cassiterite ore deposit and describe also the factors which need to be considered leading to the outcome for an accurate estimate.

(10 marks)

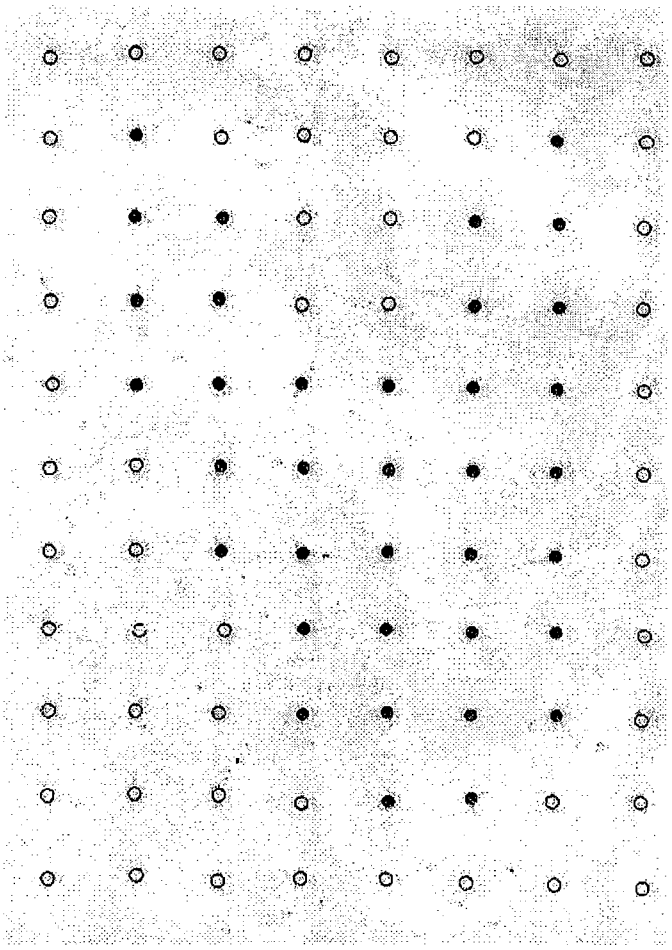
...7/-

7. [a] Discuss the differences between the following Sampling Grid Systems:

(i) Regular Grid System,
(ii) Random Stratified Grid System,
(iii) Random Grid System.

(10 marks)

[b] Calculate the Limits for the Surface Area for a copper ore deposit as follows, with a 95% Confidence Limit, using the Global Estimation Technique: (Grid size = 200 m).



(10 marks)

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APPENDIX 1

(DISCOUNTING FACTOR)

NILAI KINI UNTUK 1 PADA KADAR $r\% = (1+r)^{-n}$

r \ n	TAHUN 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1%	0.9901	0.9803	0.9706	0.9610	0.9515	0.9420	0.9327	0.9235	0.9143	0.9053	0.8963	0.8874	0.8787	0.8700	0.8613	0.8528
2%	0.9804	0.9612	0.9423	0.9238	0.9057	0.8880	0.8706	0.8535	0.8368	0.8203	0.8043	0.7885	0.7730	0.7579	0.7430	0.7284
3%	0.9709	0.9426	0.9151	0.8885	0.8626	0.8375	0.8131	0.7894	0.7664	0.7441	0.7224	0.7014	0.6810	0.6611	0.6419	0.6232
4%	0.9615	0.9246	0.8890	0.8548	0.8219	0.7903	0.7599	0.7307	0.7026	0.6756	0.6496	0.6246	0.6006	0.5775	0.5553	0.5339
5%	0.9524	0.9070	0.8638	0.8227	0.7835	0.7462	0.7107	0.6768	0.6446	0.6139	0.5847	0.5568	0.5303	0.5051	0.4810	0.4581
6%	0.9434	0.8900	0.8396	0.7921	0.7473	0.7050	0.6651	0.6274	0.5919	0.5584	0.5268	0.4970	0.4688	0.4423	0.4173	0.3936
7%	0.9346	0.8734	0.8163	0.7629	0.7130	0.6663	0.6227	0.5820	0.5439	0.5083	0.4751	0.4440	0.4150	0.3878	0.3624	0.3387
8%	0.9259	0.8573	0.7938	0.7350	0.6806	0.6302	0.5835	0.5403	0.5002	0.4632	0.4289	0.3971	0.3677	0.3405	0.3152	0.2919
9%	0.9174	0.8417	0.7722	0.7084	0.6499	0.5963	0.5470	0.5019	0.4604	0.4224	0.3875	0.3555	0.3262	0.2992	0.2745	0.2519
10%	0.9091	0.8264	0.7513	0.6830	0.6209	0.5645	0.5132	0.4665	0.4241	0.3855	0.3505	0.3186	0.2897	0.2633	0.2394	0.2176
11%	0.9009	0.8116	0.7312	0.6587	0.5935	0.5346	0.4817	0.4339	0.3909	0.3522	0.3173	0.2858	0.2575	0.2320	0.2090	0.1883
12%	0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039	0.3606	0.3220	0.2875	0.2567	0.2292	0.2046	0.1827	0.1631
13%	0.8850	0.7831	0.6931	0.6133	0.5428	0.4803	0.4251	0.3762	0.3329	0.2946	0.2607	0.2307	0.2042	0.1807	0.1599	0.1415
14%	0.8772	0.7695	0.6750	0.5921	0.5194	0.4556	0.3996	0.3506	0.3075	0.2697	0.2366	0.2076	0.1821	0.1597	0.1401	0.1229
15%	0.8696	0.7561	0.6575	0.5718	0.4972	0.4323	0.3759	0.3269	0.2843	0.2472	0.2149	0.1869	0.1625	0.1413	0.1229	0.1069
16%	0.8621	0.7432	0.6407	0.5523	0.4761	0.4104	0.3538	0.3050	0.2630	0.2267	0.1954	0.1685	0.1452	0.1252	0.1079	0.0930
17%	0.8547	0.7305	0.6244	0.5337	0.4561	0.3898	0.3332	0.2848	0.2434	0.2080	0.1778	0.1520	0.1299	0.1110	0.0949	0.0811
18%	0.8475	0.7182	0.6086	0.5158	0.4371	0.3704	0.3139	0.2660	0.2255	0.1911	0.1619	0.1372	0.1163	0.0985	0.0835	0.0708
19%	0.8403	0.7062	0.5934	0.4987	0.4190	0.3521	0.2959	0.2487	0.2090	0.1756	0.1476	0.1240	0.1042	0.0876	0.0736	0.0618
20%	0.8333	0.6944	0.5787	0.4823	0.4019	0.3349	0.2791	0.2326	0.1938	0.1615	0.1346	0.1122	0.0935	0.0779	0.0649	0.0541
21%	0.8264	0.6830	0.5645	0.4665	0.3855	0.3186	0.2633	0.2176	0.1799	0.1486	0.1228	0.1015	0.0839	0.0693	0.0573	0.0474
22%	0.8197	0.6719	0.5507	0.4514	0.3700	0.3033	0.2486	0.2038	0.1670	0.1369	0.1122	0.0920	0.0754	0.0618	0.0507	0.0415
23%	0.8130	0.6610	0.5374	0.4369	0.3552	0.2888	0.2348	0.1909	0.1552	0.1262	0.1026	0.0834	0.0678	0.0551	0.0448	0.0364
24%	0.8065	0.6504	0.5245	0.4230	0.3411	0.2751	0.2218	0.1789	0.1443	0.1164	0.0938	0.0757	0.0610	0.0492	0.0397	0.0320
25%	0.8000	0.6400	0.5120	0.4096	0.3277	0.2621	0.2097	0.1678	0.1342	0.1074	0.0859	0.0687	0.0550	0.0440	0.0352	0.0281
26%	0.7937	0.6299	0.4999	0.3968	0.3149	0.2499	0.1983	0.1574	0.1249	0.0992	0.0787	0.0625	0.0496	0.0393	0.0312	0.0248
27%	0.7874	0.6200	0.4882	0.3844	0.3027	0.2383	0.1877	0.1478	0.1164	0.0916	0.0721	0.0568	0.0447	0.0352	0.0277	0.0218
28%	0.7813	0.6104	0.4768	0.3725	0.2910	0.2274	0.1776	0.1388	0.1084	0.0847	0.0662	0.0517	0.0404	0.0316	0.0247	0.0193
29%	0.7752	0.6009	0.4658	0.3611	0.2799	0.2170	0.1682	0.1304	0.1011	0.0784	0.0607	0.0471	0.0365	0.0283	0.0219	0.0170
30%	0.7692	0.5917	0.4552	0.3501	0.2693	0.2072	0.1594	0.1226	0.0943	0.0725	0.0558	0.0429	0.0330	0.0254	0.0195	0.0150
31%	0.7634	0.5827	0.4448	0.3396	0.2592	0.1979	0.1510	0.1153	0.0880	0.0672	0.0513	0.0392	0.0299	0.0228	0.0174	0.0133
32%	0.7576	0.5739	0.4348	0.3294	0.2495	0.1890	0.1432	0.1085	0.0822	0.0623	0.0472	0.0357	0.0271	0.0205	0.0155	0.0118
33%	0.7519	0.5653	0.4251	0.3196	0.2403	0.1807	0.1358	0.1021	0.0768	0.0577	0.0434	0.0326	0.0245	0.0185	0.0139	0.0104
34%	0.7463	0.5569	0.4156	0.3102	0.2315	0.1727	0.1289	0.0962	0.0718	0.0536	0.0400	0.0298	0.0223	0.0166	0.0124	0.0093
35%	0.7407	0.5487	0.4064	0.3011	0.2230	0.1652	0.1224	0.0906	0.0671	0.0497	0.0368	0.0273	0.0202	0.0150	0.0111	0.0082
36%	0.7353	0.5407	0.3975	0.2923	0.2149	0.1580	0.1162	0.0854	0.0628	0.0462	0.0340	0.0250	0.0184	0.0135	0.0099	0.0073
37%	0.7299	0.5328	0.3889	0.2839	0.2072	0.1512	0.1104	0.0806	0.0588	0.0429	0.0313	0.0229	0.0167	0.0122	0.0089	0.0065
38%	0.7246	0.5251	0.3805	0.2757	0.1998	0.1448	0.1049	0.0760	0.0551	0.0399	0.0289	0.0210	0.0152	0.0110	0.0080	0.0058
39%	0.7194	0.5176	0.3724	0.2679	0.1927	0.1386	0.0997	0.0718	0.0516	0.0371	0.0267	0.0192	0.0138	0.0099	0.0072	0.0051
40%	0.7143	0.5102	0.3644	0.2603	0.1859	0.1328	0.0949	0.0678	0.0484	0.0346	0.0247	0.0176	0.0126	0.0090	0.0064	0.0046
41%	0.7092	0.5030	0.3567	0.2530	0.1794	0.1273	0.0903	0.0640	0.0454	0.0322	0.0228	0.0162	0.0115	0.0081	0.0058	0.0041
42%	0.7042	0.4959	0.3492	0.2459	0.1732	0.1220	0.0859	0.0605	0.0426	0.0300	0.0211	0.0149	0.0105	0.0074	0.0052	0.0037
43%	0.6993	0.4890	0.3420	0.2391	0.1672	0.1169	0.0818	0.0572	0.0400	0.0280	0.0196	0.0137	0.0096	0.0067	0.0047	0.0033
44%	0.6944	0.4823	0.3349	0.2326	0.1615	0.1122	0.0779	0.0541	0.0376	0.0261	0.0181	0.0126	0.0087	0.0061	0.0042	0.0029
45%	0.6897	0.4756	0.3280	0.2262	0.1560	0.1076	0.0742	0.0512	0.0353	0.0243	0.0168	0.0116	0.0080	0.0055	0.0038	0.0026
46%	0.6849	0.4691	0.3213	0.2201	0.1507	0.1032	0.0707	0.0484	0.0332	0.0227	0.0156	0.0107	0.0073	0.0050	0.0034	0.0023
47%	0.6803	0.4628	0.3148	0.2142	0.1457	0.0991	0.0674	0.0459	0.0312	0.0212	0.0144	0.0098	0.0067	0.0045	0.0031	0.0021
48%	0.6757	0.4565	0.3085	0.2084	0.1408	0.0952	0.0643	0.0434	0.0294	0.0198	0.0134	0.0091	0.0061	0.0041	0.0028	0.0019
49%	0.6711	0.4504	0.3023	0.2029	0.1362	0.0914	0.0613	0.0412	0.0276	0.0185	0.0124	0.0084	0.0056	0.0038	0.0025	0.0017
50%	0.6667	0.4444	0.2963	0.1975	0.1317	0.0878	0.0585	0.0390	0.0260	0.0173	0.0116	0.0077	0.0051	0.0034	0.0023	0.0015

APPENDIX 2

(COMPOUNDING FACTOR)

r \ n	TAHUN															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1%	1.010	1.020	1.030	1.041	1.051	1.062	1.072	1.083	1.094	1.105	1.116	1.127	1.138	1.149	1.161	1.173
2%	1.020	1.040	1.061	1.082	1.104	1.126	1.149	1.172	1.195	1.219	1.243	1.268	1.294	1.319	1.346	1.373
3%	1.030	1.061	1.093	1.126	1.159	1.194	1.230	1.267	1.305	1.344	1.384	1.426	1.469	1.513	1.558	1.605
4%	1.040	1.082	1.125	1.170	1.217	1.265	1.316	1.369	1.423	1.480	1.539	1.601	1.665	1.732	1.801	1.873
5%	1.050	1.103	1.158	1.216	1.276	1.340	1.407	1.477	1.551	1.629	1.710	1.796	1.886	1.980	2.079	2.183
6%	1.060	1.124	1.191	1.262	1.338	1.419	1.504	1.594	1.689	1.791	1.898	2.012	2.133	2.261	2.397	2.540
7%	1.070	1.145	1.225	1.311	1.403	1.501	1.606	1.718	1.838	1.967	2.105	2.252	2.410	2.579	2.759	2.952
8%	1.080	1.166	1.260	1.360	1.469	1.587	1.714	1.851	1.999	2.159	2.332	2.518	2.720	2.937	3.172	3.426
9%	1.090	1.188	1.295	1.412	1.539	1.677	1.828	1.993	2.172	2.367	2.580	2.813	3.066	3.342	3.642	3.970
10%	1.100	1.210	1.331	1.464	1.611	1.772	1.949	2.144	2.358	2.594	2.853	3.138	3.452	3.797	4.177	4.595
11%	1.110	1.232	1.368	1.518	1.685	1.870	2.076	2.305	2.558	2.839	3.152	3.498	3.883	4.310	4.785	5.311
12%	1.120	1.254	1.405	1.574	1.762	1.974	2.211	2.476	2.773	3.106	3.479	3.896	4.363	4.887	5.474	6.130
13%	1.130	1.277	1.443	1.630	1.842	2.082	2.353	2.658	3.004	3.395	3.836	4.335	4.898	5.535	6.254	7.067
14%	1.140	1.300	1.482	1.689	1.925	2.195	2.502	2.853	3.252	3.707	4.226	4.818	5.492	6.261	7.138	8.137
15%	1.150	1.323	1.521	1.749	2.011	2.313	2.660	3.059	3.518	4.046	4.652	5.350	6.153	7.076	8.137	9.358
16%	1.160	1.346	1.561	1.811	2.100	2.436	2.826	3.278	3.803	4.411	5.117	5.936	6.886	7.988	9.266	10.748
17%	1.170	1.369	1.602	1.874	2.192	2.565	3.001	3.511	4.108	4.807	5.624	6.580	7.699	9.007	10.539	12.330
18%	1.180	1.392	1.643	1.939	2.288	2.700	3.185	3.759	4.435	5.234	6.176	7.288	8.599	10.147	11.974	14.129
19%	1.190	1.416	1.685	2.005	2.386	2.840	3.379	4.021	4.785	5.695	6.777	8.064	9.596	11.420	13.590	16.172
20%	1.200	1.440	1.728	2.074	2.488	2.986	3.583	4.300	5.160	6.192	7.430	8.916	10.699	12.839	15.407	18.488
21%	1.210	1.464	1.772	2.144	2.594	3.138	3.797	4.595	5.560	6.727	8.140	9.850	11.918	14.421	17.449	21.114
22%	1.220	1.488	1.816	2.215	2.703	3.297	4.023	4.908	5.987	7.305	8.912	10.872	13.264	16.182	19.742	24.086
23%	1.230	1.513	1.861	2.289	2.815	3.463	4.259	5.239	6.444	7.926	9.749	11.991	14.749	18.141	22.314	27.446
24%	1.240	1.538	1.907	2.364	2.932	3.635	4.508	5.590	6.931	8.594	10.657	13.215	16.386	20.319	25.196	31.243
25%	1.250	1.563	1.953	2.441	3.052	3.815	4.768	5.960	7.451	9.313	11.642	14.552	18.190	22.737	28.422	35.527
26%	1.260	1.588	2.000	2.520	3.176	4.002	5.042	6.353	8.005	10.086	12.708	16.012	20.175	25.421	32.030	40.358
27%	1.270	1.613	2.048	2.601	3.304	4.196	5.329	6.768	8.595	10.915	13.862	17.605	22.359	28.396	36.062	45.799
28%	1.280	1.638	2.097	2.684	3.436	4.398	5.629	7.206	9.223	11.806	15.112	19.343	24.759	31.691	40.565	51.923
29%	1.290	1.664	2.147	2.769	3.572	4.608	5.945	7.669	9.893	12.761	16.462	21.236	27.395	35.339	45.587	58.808
30%	1.300	1.690	2.197	2.856	3.713	4.827	6.275	8.157	10.604	13.786	17.922	23.298	30.288	39.374	51.186	66.542
31%	1.310	1.716	2.248	2.945	3.858	5.054	6.621	8.673	11.362	14.884	19.498	25.542	33.460	43.833	57.421	75.221
32%	1.320	1.742	2.300	3.036	4.007	5.290	6.983	9.217	12.166	16.060	21.199	27.983	36.937	48.757	64.359	84.954
33%	1.330	1.769	2.353	3.129	4.162	5.535	7.361	9.791	13.022	17.319	23.034	30.635	40.745	54.190	72.073	95.858
34%	1.340	1.796	2.406	3.224	4.320	5.789	7.758	10.395	13.930	18.666	25.012	33.516	44.912	60.182	80.644	108.063
35%	1.350	1.823	2.460	3.322	4.484	6.053	8.172	11.032	14.894	20.107	27.144	36.644	49.470	66.784	90.158	121.714
36%	1.360	1.850	2.515	3.421	4.653	6.328	8.605	11.703	15.917	21.647	29.439	40.037	54.451	74.053	100.713	136.969
37%	1.370	1.877	2.571	3.523	4.826	6.612	9.058	12.410	17.001	23.292	31.910	43.717	59.892	82.052	112.411	154.003
38%	1.380	1.904	2.628	3.627	5.005	6.907	9.531	13.153	18.151	25.049	34.568	47.703	65.831	90.846	125.368	173.008
39%	1.390	1.932	2.686	3.733	5.189	7.213	10.025	13.935	19.370	26.925	37.425	52.021	72.309	100.510	139.708	194.194
40%	1.400	1.960	2.744	3.842	5.378	7.530	10.541	14.758	20.661	28.925	40.496	56.694	79.371	111.120	155.568	217.795
41%	1.410	1.988	2.803	3.953	5.573	7.858	11.080	15.623	22.028	31.059	43.794	61.749	87.066	122.763	173.096	244.065
42%	1.420	2.016	2.863	4.066	5.774	8.198	11.642	16.531	23.474	33.334	47.334	67.214	95.444	135.530	192.453	273.284
43%	1.430	2.045	2.924	4.182	5.980	8.551	12.228	17.486	25.005	35.757	51.132	73.119	104.561	149.522	213.816	305.757
44%	1.440	2.074	2.986	4.300	6.192	8.916	12.839	18.488	26.623	38.338	55.206	79.497	114.475	164.845	237.376	341.822
45%	1.450	2.103	3.049	4.421	6.410	9.294	13.476	19.541	28.334	41.085	59.573	86.381	125.252	181.615	263.342	381.846
46%	1.460	2.132	3.112	4.544	6.634	9.685	14.141	20.645	30.142	44.008	64.251	93.807	136.958	199.959	291.939	426.232
47%	1.470	2.161	3.177	4.669	6.864	10.090	14.833	21.804	32.052	47.117	69.261	101.814	149.667	220.010	323.415	475.420
48%	1.480	2.190	3.242	4.798	7.101	10.509	15.554	23.019	34.069	50.422	74.624	110.444	163.457	241.916	358.035	529.892
49%	1.490	2.220	3.308	4.929	7.344	10.943	16.304	24.294	36.197	53.934	80.362	119.739	178.411	265.832	396.090	590.174
50%	1.500	2.250	3.375	5.062	7.594	11.391	17.086	25.629	38.443	57.665	86.498	129.746	194.620	291.929	437.894	656.841

APPENDIX 3

(NET ANNUITY VALUE)

NILAI KINI ANUITI UNTUK 1 PADA KADAR $r\%$ $\left[= \frac{1 - (1 + r)^{-n}}{r} \right]$

	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.9009	0.8929	0.8850	0.8772	0.8696	0.8621	0.8547
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.7125	1.6901	1.6681	1.6467	1.6257	1.6052	1.5852
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4437	2.4018	2.3612	2.3216	2.2832	2.2459	2.2096
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.1024	3.0373	2.9745	2.9137	2.8550	2.7982	2.7432
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6959	3.6048	3.5172	3.4331	3.3522	3.2743	3.1993
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.2305	4.1114	3.9975	3.8887	3.7845	3.6847	3.5892
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.7122	4.5638	4.4226	4.2883	4.1604	4.0386	3.9224
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	5.1461	4.9676	4.7988	4.6389	4.4873	4.3436	4.2072
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.5370	5.3282	5.1317	4.9464	4.7716	4.6065	4.4506
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.8892	5.6502	5.4262	5.2161	5.0188	4.8332	4.6586
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	6.2065	5.9377	5.6869	5.4527	5.2337	5.0286	4.8364
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.4924	6.1944	5.9176	5.6603	5.4206	5.1971	4.9884
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.7499	6.4235	6.1218	5.8424	5.5831	5.3423	5.1183
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.9819	6.6282	6.3025	6.0021	5.7245	5.4675	5.2293
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	7.1909	6.8109	6.4624	6.1422	5.8474	5.5755	5.3242
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	7.3792	6.9740	6.6039	6.2651	5.9542	5.6685	5.4053
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.5488	7.1196	6.7291	6.3729	6.0472	5.7487	5.4746
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.7016	7.2497	6.8399	6.4674	6.1280	5.8178	5.5339
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.8393	7.3658	6.9380	6.5504	6.1982	5.8775	5.5845
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.9633	7.4694	7.0248	6.6231	6.2593	5.9288	5.6278
21	18.8570	17.0112	15.4150	14.0292	12.8212	11.7641	10.8355	10.0168	9.2922	8.6487	8.0751	7.5620	7.1016	6.6870	6.3125	5.9731	5.6648
22	19.6604	17.6580	15.9369	14.4511	13.1630	12.0416	11.0612	10.2007	9.4424	8.7715	8.1757	7.6446	7.1695	6.7429	6.3587	6.0113	5.6964
23	20.4558	18.2922	16.4436	14.8568	13.4886	12.3034	11.2722	10.3711	9.5802	8.8832	8.2664	7.7184	7.2297	6.7921	6.3988	6.0442	5.7234
24	21.2434	18.9139	16.9355	15.2470	13.7986	12.5504	11.4693	10.5288	9.7066	8.9847	8.3481	7.7843	7.2829	6.8351	6.4338	6.0726	5.7465
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	8.4217	7.8431	7.3300	6.8729	6.4641	6.0971	5.7662
26	22.7952	20.1210	17.8768	15.9828	14.3752	13.0032	11.8258	10.8100	9.9290	9.1609	8.4881	7.8957	7.3717	6.9061	6.4906	6.1182	5.7831
27	23.5596	20.7069	18.3270	16.3296	14.6430	13.2105	11.9867	10.9352	10.0266	9.2372	8.5478	7.9426	7.4086	6.9352	6.5135	6.1364	5.7975
28	24.3164	21.2813	18.7641	16.6631	14.8981	13.4062	12.1371	11.0511	10.1161	9.3066	8.6016	7.9844	7.4412	6.9607	6.5335	6.1520	5.8099
29	25.0658	21.8444	19.1885	16.9837	15.1411	13.5907	12.2777	11.1584	10.1983	9.3696	8.6501	8.0218	7.4701	6.9830	6.5509	6.1656	5.8204
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.6938	8.0552	7.4957	7.0027	6.5660	6.1772	5.8294
31	26.5423	22.9377	20.0004	17.5885	15.5928	13.9291	12.5318	11.3498	10.3428	9.4790	8.7331	8.0850	7.5183	7.0199	6.5791	6.1872	5.8371
32	27.2696	23.4683	20.3888	17.8736	15.8027	14.0840	12.6466	11.4350	10.4062	9.5264	8.7686	8.1116	7.5383	7.0350	6.5905	6.1959	5.8437
33	27.9897	23.9886	20.7658	18.1476	16.0025	14.2302	12.7538	11.5139	10.4644	9.5694	8.8005	8.1354	7.5560	7.0482	6.6005	6.2034	5.8493
34	28.7027	24.4986	21.1318	18.4112	16.1929	14.3681	12.8540	11.5869	10.5178	9.6086	8.8293	8.1566	7.5717	7.0599	6.6091	6.2098	5.8541
35	29.4086	24.9986	21.4872	18.6646	16.3742	14.4982	12.9477	11.6546	10.5668	9.6442	8.8552	8.1755	7.5856	7.0700	6.6166	6.2153	5.8582
36	30.1075	25.4888	21.8323	18.9083	16.5469	14.6210	13.0352	11.7172	10.6118	9.6765	8.8786	8.1924	7.5979	7.0790	6.6231	6.2201	5.8617
37	30.7995	25.9695	22.1672	19.1426	16.7113	14.7368	13.1170	11.7752	10.6530	9.7059	8.8996	8.2075	7.6087	7.0868	6.6288	6.2242	5.8647
38	31.4847	26.4406	22.4925	19.3679	16.8679	14.8460	13.1935	11.8289	10.6908	9.7327	8.9186	8.2210	7.6183	7.0937	6.6338	6.2278	5.8673
39	32.1630	26.9026	22.8082	19.5845	17.0170	14.9491	13.2649	11.8786	10.7255	9.7570	8.9357	8.2330	7.6268	7.0997	6.6380	6.2309	5.8695
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.9511	8.2438	7.6344	7.1050	6.6418	6.2335	5.8713
41	33.4997	27.7995	23.4124	19.9931	17.2944	15.1380	13.3941	11.9672	10.7866	9.7991	8.9649	8.2534	7.6410	7.1097	6.6450	6.2358	5.8729
42	34.1581	28.2348	23.7014	20.1856	17.4232	15.2245	13.4524	12.0067	10.8134	9.8174	8.9774	8.2619	7.6469	7.1138	6.6478	6.2377	5.8743
43	34.8100	28.6616	23.9819	20.3708	17.5459	15.3062	13.5070	12.0432	10.8380	9.8340	8.9886	8.2696	7.6522	7.1173	6.6503	6.2394	5.8755
44	35.4555	29.0800	24.2543	20.5488	17.6628	15.3832	13.5579	12.0771	10.8605	9.8491	8.9988	8.2764	7.6568	7.1205	6.6524	6.2409	5.8765
45	36.0945	29.4902	24.5187	20.7200	17.7741	15.4558	13.6055	12.1084	10.8812	9.8628	9.0079	8.2825	7.6609	7.1232	6.6543	6.2421	5.8773
46	36.7272	29.8923	24.7754	20.8847	17.8801	15.5244	13.6500	12.1374	10.9002	9.8753	9.0161	8.2880	7.6645	7.1256	6.6559	6.2432	5.8781
47	37.3537	30.2866	25.0247	21.0429	17.9810	15.5890	13.6916	12.1643	10.9176	9.8866	9.0235	8.2928	7.6677	7.1277	6.6573	6.2442	5.8787
48	37.9740	30.6731	25.2667	21.1951	18.0772	15.6500	13.7305	12.1891	10.9336	9.8969	9.0302	8.2972	7.6705	7.1296	6.6585	6.2450	5.8792
49	38.5881	31.0521	25.5017	21.3415	18.1687	15.7076	13.7668	12.2122	10.9482	9.9063	9.0362	8.3010	7.6730	7.1312	6.6596	6.2457	5.8797
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	9.0417	8.3045	7.6752	7.1327	6.6605	6.2463	5.8801